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EPA Region 5 Records Ctr.



379018

**CONTAMINATION EVALUATION  
FORMER NIKE BATTERY C-70  
NAPERVILLE, ILLINOIS  
CONTRACT NO. DACA 49-87-D-0012**

**PREPARED FOR:  
U.S. ARMY CORPS OF ENGINEERS  
BUFFALO DISTRICT  
BUFFALO, NEW YORK 14207-3199**

**BY  
IT CORPORATION  
ITASCA, ILLINOIS**

**JANUARY 1991  
PROJECT NO. 312021.02**



INTERNATIONAL  
TECHNOLOGY  
CORPORATION

January 21, 1991

Ms. Sophie Baj  
U.S. Army COE, Buffalo District  
1776 Niagara Street  
Buffalo, New York 14207-3199

Dear Ms. Baj:

Enclosed please find final reports of the contamination evaluations done on the following sites:

Naperville, IL - NIKE site C-70  
Libertyville, IL - NIKE site C-92  
Orland Park, IL - NIKE site C-54

Lake Zurich, IL - NIKE site C-84  
Menomonee Falls, WI - NIKE site M-86  
Dixon, IL - Green River Ordnance Plant

Also, I have enclosed the professional engineer sign off which was omitted from the Franklin, WI report previously sent.

In response to a comment on the Menomonee Falls, WI report, Westinghouse was contacted again about the possibility of PCBs in the transformers. They continue to be non-responsive.

Please call at your convenience with any questions.

Very truly yours,

IT CORPORATION

George FitzGerald  
Director - Geosciences

Enclosures

cc: Corps of Engineers  
Huntsville Division  
Attn: HNDED-PM  
106 Wynn Drive  
Huntsville, Alabama 35805

Missouri River Division  
Attn: Kevin Coats/CEMRD-EDGC  
POB 103  
Downtown Station  
Omaha, Nebraska 68101-0103

USACE  
Department of the Army  
Attn: DAEN-ECE-B  
Pulaski Building  
20 Massachusetts Avenue N.W.  
Washington, D.C. 20317

U.S. Army COE  
Omaha, District  
MRDED-E  
215 North 17th Street  
Omaha, Nebraska 68102-4910

U.S. Army Engineer District  
Chicago District  
219 Dearborn Street  
Chicago, IL 60604

Regional Office

333 Pierce Road • Suite 200 • Itasca, Illinois 60143 • 708-250-7788

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This Contamination Evaluation for the Former NIKE Battery C-70, Naperville, Illinois has been reviewed and approved by the undersigned Registered Professional Engineer.



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## 1.0 EXECUTIVE SUMMARY

A contamination evaluation was performed at the former NIKE Battery C-70 site in Naperville, Illinois (see Figure 1). The site is currently owned by the City of Naperville and by Park Place Associates. The city operates a park known as NIKE park on their portion of the former battery and Park Place Associates have built an office park on their portion of the site. The contamination evaluation included a records review and visual site inspection, installation of three ground water monitoring wells, collection of ground water samples, and collection of soil samples from each well boring. All of the samples were analyzed for total petroleum hydrocarbons, total metals and volatile organics.

Well installation and sampling were carried out as planned. Ground water was located at 33 to 40 feet below ground surface. Analytical results from the soil sampling and ground water sampling program indicated: arsenic, chromium and lead exceeded Maximum Contaminant Levels (MCLs) in ground water samples from all three wells; arsenic, lead and mercury exceeded U.S. typical metals concentration averages in all three soil samples (except arsenic in SB-03); low total petroleum hydrocarbon concentration were detected in both soil and water samples (maximum of 96 ppm in SB-03 and 1.1 ppm in MW-01) and trace concentrations of volatile organics were detected in SB-01 (2 butanone at 13 ppb) and MW-01 (ethylbenzene at 5.2 ppm).

Results from the evaluation of site C-70 indicate that soils and ground water in the vicinity of soil borings and monitoring wells installed for this evaluation are potentially contaminated with organic solvents or petroleum fuels.

## 2.0 GENERAL

### 2.1 INTRODUCTION

The Department of the Army is responsible for the administration of the Defense Environmental Restoration Account (DERA). The objective of the DERA program is to identify and remedy environmental problems due to Department of Defense (DOD) activities at facilities formerly owned and operated by the DOD.

IT Corporation (IT) was asked as part of this program, under Contract No. DACA49-87-D-0012, to perform a contamination evaluation at former NIKE Battery C-70 in Naperville, Illinois. The Scope of Work (SOW) prepared by the U.S. Army Corps of Engineers (COE) detailed the tasks to be accomplished in order to complete this evaluation (Appendix A). These tasks included a review of pertinent records, followed by a site inspection to determine potential sources of contaminants and sampling locations. Following the site inspection, site specific plans were developed for Health and Safety, Sampling/Analysis - Quality Assurance/Quality Control, and Monitoring Well Installation. These latter two plans comprise the site specific work plan. These site specific plans supplemented the previously submitted Program Plans (Health and Safety, Sampling/Analysis - Quality Assurance/Quality Control, Monitoring Well Installation) which presented general program work procedures. Sampling and analysis were then carried out in accordance with the work and program plans.

The submission of this final report and the HRS form (Appendix B) complete those tasks detailed in the SOW (Appendix A).

### 2.2 PROJECT OBJECTIVES

The objective of this Contamination Evaluation is to make a preliminary determination of the presence or absence of chemical contamination which may have been caused by the use of this site

by the U.S. Army. To accomplish this objective, three ground water monitoring wells were installed and soil and ground water samples were collected.

Normal operating practices at NIKE batteries involved the storage, handling, and disposal of missile components as well as solvents, fuels, hydraulic fluids and paints. Records for NIKE facilities across the country indicate the possibility of contamination of ground water and/or subsurface soils by hazardous/toxic substances. The most probable contaminants are volatile organics, solvents, gasoline, diesel fuel, fuel additives, paints and related substances, and battery electrolytes.

### 2.3 SITE LOCATION AND GEOLOGY

The former NIKE Battery C-70 is located southwest of the intersection of Diehl and Park streets on the north side of the City of Naperville, in DuPage County, Illinois, approximately two miles northeast of the West Branch of the DuPage River (Figure 1). The elevation of the study area is approximately 740 feet above mean sea level (MSL). Ground water flow direction, as determined by this study, is to the northwest towards the West Branch of the DuPage River.

The geology of DuPage County, Illinois is characterized by Quaternary age unconsolidated glacial deposits (i.e., pebbly clay till, silt, sand and gravel) generally ranging in thickness from 50 to 150 feet, overlying a thick (up to 2,500 feet) sequence of Silurian, Ordovician and Cambrian aged dolomites, shales and sandstones. Precambrian granitic rocks underlie this thick sedimentary sequence.

Research before field work commenced had indicated that subsurface geology in the vicinity of the site was characterized by a local thickness of unconsolidated glacial deposits of



between 50 and 100 feet. A boring log from Naperville Public Water Supply Well No. 10, located due west and within one-half mile of the site, indicated an unconsolidated deposit of pebbly clay till, gravel and clay to a depth of 64 feet. Shallow exploratory borings (i.e., 10 to 25 feet), conducted in 1984 and 1985 by Testing Service Corporation at the site as part of a geotechnical study, indicated site subsurface soil consisted of a brown, silty clay overlying a deposit of sand and gravel with some cobbles and boulders. The thickness of the silty clay ranged from about 8 to 11 feet. Most of the borings encountered but did not completely penetrate the sand and gravel layer. Water was not encountered in any of the 1985 boreholes during drilling. Water was observed in a 15 foot borehole drilled in 1984 within a local depression at the north end of the site approximately 10 feet below grade. This boring did not penetrate the underlying sand and gravel and most probably represented a local perched system. Ground water was encountered at 33 to 44 feet below surface during this investigation.

#### 2.4 OWNERSHIP AND PRIOR USE

Former NIKE Battery C-70 site is located southwest of the intersection of Diehl and Park Streets on the north side of the City of Naperville, DuPage County, Illinois (Figure 1). The property was used as a launch, housing and control facility. The launch area is the focus of the current investigation. The Housing/Control and Launch Area was comprised of 61.11 acres of fee owned land and 40.95 acres of easements. The fee owned land was divided between the Housing/Control Area (13.83 acres) and the Launch Area (47.28 acres). The Launch Area consisted of ten structures which included three missile silos and an acid storage facility. The former Launch Area structures are shown in Figure 2.

The property was purchased by the Department of Defense (DOD) in 1955 and 1956 for use as the NIKE-Hercules Site C-70. Following

its declaration as surplus on May 14, 1964, the site was deactivated and sold. 33.06 acres of the site were purchased on June 18, 1968 by Mr. Leonard Harris of Glencoe, Illinois from the Government Services Administration and subsequently put into a trust by him. This trust was purchased by Mr. Thomas Woefle in 1973 and transferred to the LaSalle Bank. Presently, of the 47.28 fee acres which comprised the former Launch Area, 33.06 acres are a privately owned office park (Park Place of Naperville), and 14.11 acres are owned and used by the City of Naperville as a recreational park (Nike Park). More development is planned by Park Place of Naperville on their site. The only structure remaining from the original NIKE Battery C-70 is a missile silo which has been integrated into the design of a recently completed commercial building and will be used as a storage facility. The other silos have been caved in and buried. The layout of existing commercial development at the former Launch Area is shown in Figure 2. During construction, various debris (ductwork and piping) in the missile silos, and an underground fuel tank (which had been crushed and buried), were found by the construction firm.

One of the Park Place buildings (#1717), just south of this remaining silo, occupies or is immediately adjacent to the land on which the former acid neutralizing pit, fueling stations, pump house, missile assembly and test building, and generator building were located.

### 3.0 SITE INVESTIGATION

#### 3.1 INTRODUCTION

The first part of this section provides detailed information concerning well installation at NIKE C-70 including the locations of the wells and the rationale for these locations, a summary of the drilling and installation procedures, details of well development and hydraulic conductivity testing.

The second portion of this section discusses the sampling program including methods of sample collection, analytical parameters, methods of shipment and laboratories that performed the analyses.

#### 3.2 MONITORING WELL LOCATIONS AND INSTALLATION

##### 3.2.1 Monitoring Well Locations

The three monitoring wells were placed downgradient of potential source areas of contamination. These areas include: the former missile assembly and test/generator building complex and the acid fueling storage facilities.

Monitoring Well 01 (MW-01) was installed south-southwest (assumed downgradient direction) of the former missile assembly and test building/generator building complex (Figure 2). This location was selected to intercept contamination which may have been caused by any underground fuel tank lines and drainage systems which may have been present in this area. In addition, this well would be downgradient of other former structures (e.g., the south missile silo and the acid neutralizing pit and fueling stations) of the Launch Area.

Monitoring Well 02 (MW-02) was installed south-southwest (again, assumed downgradient direction) of the former acid storage shed (Figure 2). This location was selected to intercept any contamination that may have been caused by any fuel tanks which may have been present there.

Monitoring Well 03 (MW-03) was installed west of the missile assembly and test building (Figure 2). This location was selected to provide additional ground water flow information and to intercept any contamination from the north missile area.

### 3.2.2 Drilling

One 45 foot soil boring was drilled at former NIKE Battery C-70 on August 9, 1988 (MW-03). Two other borings, MW-01 to 39 feet and MW-02 to 39.5 feet were drilled on August 16, 1988. The borings were completed using 4 ¼ inch I.D. hollow stem augers. All cuttings from the borings were placed in drums, sealed and stored at a storage area provided by the City of Naperville. They have since been disposed of by the City of Naperville upon receipt of instructions to do so by the Corps of Engineers through IT Corporation. The augers and drill rig were steam cleaned prior to drilling at each location and after drilling was completed. Water from steam cleaning was allowed to drain into the ground. No water was used in drilling. The drilling subcontractor was Exploration Technology, Inc. of Madison, WI.

During drilling, continuous split spoon samples were collected to a depth of 10 feet and then at 5 foot intervals thereafter as was specified in the Program Plan. Detailed boring logs were compiled from the split spoon samples (Appendix C). Each boring log contains descriptions of each sample, a USCS (Unified Soil Classification System) classification, blow counts and HNu readings. No soil samples had significant HNu readings. Samples were taken at depths which were shallow enough to have been contaminated by surface spills, silos and underground storage tanks but at depths which would be below soil disturbed by the construction and regrading of the site. Samples were taken from several depths as the sample volume from a single split spoon was insufficient to fill all of the sample containers. Volatile organic samples were taken from the first split spoon and other samples from the following intervals.

Ground water was encountered at 33 to 40 feet below ground surface. Brown silty clay was encountered in all three wells to a depth of 8 to 14 feet. Underlying this clay are sand and gravel deposits to the bottom of the wells.

### 3.2.3 Well Construction

Monitoring wells were installed as specified in the Program Plan except that a 0.5 foot sump was used on each well instead of a 2 foot sump. This variance was due to the drilling company not having brought the correct PVC riser pipe with them. MW-01 was installed with the 0.5 foot sump (38.5' - 39'), a ten foot screened interval above the sump (28.5' - 38.5'), a two foot bentonite plug and grout to the surface. MW-02 was installed with the 0.5 foot sump (39.0' - 39.5'), a ten foot screened interval above the sump (29' - 39'), two feet of sand pack above the screened interval (27' - 29'), a two foot bentonite plug, and grout to the surface. MW-03 was installed with a 0.5 foot sump (44.5' - 45'), a ten foot screened interval above the sump, two feet of sand pack above the screen, a two foot bentonite plug and grout to the surface.

The well riser pipes, screens, and sumps are 2 inch ID Schedule 40 PVC. The screens are 10 feet in length with 0.010 slot size. The wells were installed through hollow stem augers; the augers were slowly removed as the sand pack was added. Since the site is currently a park, steel flush mounted locking protective covers were installed over the wells. Later, the wells were surveyed and ground water elevations were calculated and are presented in Table 1. Surveying calculations and notes are presented in Appendix D.

### 3.2.4 Well Development

The three monitoring wells were developed on August 18 and 19, 1988 using bailers. For MW-01, a relatively short (about 1') PVC bailer was used due to an "out of plumb" well which would not

permit a 2' length bailer down the well. For MW-02 and MW-03, standard stainless steel bailers were used. All well development water was discharged and allowed to infiltrate the ground. The volume of water removed from each well and the water condition is listed in Table 1. As required by the Monitoring Well Installation Program Plan, a minimum of five times the volume of water in the well must be evacuated from a well during development. During development of MW-01 and MW-03, more than five times volume was removed and the water remained very turbid. It appeared that further development would not improve the clarity of the water, so development was halted. The wells are set in unconsolidated sediments which may account for the inability to develop the wells to clearness. MW-02 went dry after 20 bailers (about 5.2 gallons) of water were removed. The well was allowed to recharge and bailed dry a total of two times during development.

### 3.2.5 Hydraulic Conductivity Testing

Hydraulic conductivity tests were performed on the three monitoring wells on August 18 and 19, 1988. The method of testing employed for MW-02 and MW-03 was rising head using a downhole pressure transducer and a Compaq field computer to collect the data. A "slug" of water was removed from the well for each test. Three to four tests were run on each monitoring well to verify the results and insure that representative values could be calculated from the data. Before each test was begun, the pressure transducer was lowered into the column of water in the well and the water level was allowed to stabilize. Water was removed from the well with a stainless steel bailer while instantaneously starting the computer program. The computer then recorded the changing water pressure via the transducer as the head rose back to static level. From the rate of the rising head during each test the conductivity can be estimated.

Problems arose with the conductivity test on MW-01 due to the "out of plumb" nature of the well. The bailer and transducer would not fit down the well together. The hydraulic conductivity test was therefore done manually using a bailer and water level indicator. The values were calculated and graphed by hand and, as a result, only one test was done.

The results of the tests are summarized in Table 5. Calculations for MW-01 and the method used are presented in Appendix E. The average calculated values are within the ranges from silt through silty sand to clean sand. MW-03 had the greatest hydraulic conductivity values and MW-01 had the lowest values. The calculated values for all three wells agree quite well with expected values for the types of soil encountered in the borings (Appendix C). The conductivity values were consistent with the very dense sand to silty sand in the screened interval.

### 3.3 SAMPLING PROGRAM

#### 3.3.1 Soil Sampling

One soil sample per boring was collected for chemical analysis and a total of two soil samples from all three borings were collected for geotechnical analysis. The samples were collected via split spoon sampler from the borings for the monitoring wells during drilling. The split spoon samples were decontaminated prior to use by: washing with a trisodium phosphate solution, rinsing with distilled water, rinsing with methanol and finally rinsing again with distilled water. The parameters that each chemical soil sample was analyzed for included volatile organics, total petroleum hydrocarbons, and total metals. The two geotechnical samples were analyzed for grain size distribution, Atterburg limits, and moisture content. A summary of the results of the soil analysis is presented in Table 3 and the complete analytical data package is presented in Appendix G. The geotechnical analysis is presented in Appendix F.

The soil samples were analyzed by the IT Analytical Services Laboratory in Export, Pennsylvania. QC samples were also analyzed by IT Analytical Services Laboratory in Export, Pennsylvania. QA samples were analyzed by the Corps of Engineers Missouri River Division Laboratory in Omaha, Nebraska. All samples were packed in ice and shipped on the day of collection via overnight courier. Completed Chain-of-Custody and Request for Analysis forms accompanied the samples.

### 3.3.2 Ground Water Sampling

The three monitoring wells were sampled on August 18 and 19, 1988. The water source used for drilling was sampled on August 9, 1988. Prior to developing and sampling each well, a water level measurement was taken. The well development is discussed in Section 3.2.4. All development water was discharged and allowed to infiltrate the ground.

Sampling took place immediately after development for MW-01 and MW-03. MW-02 was developed to dryness and allowed to recharge (the last time for forty-five minutes) a total of three times before sampling.

Stainless steel bailers with teflon check valves were used to collect samples from MW-02 and MW-03. For MW-01, a relatively short 1' PVC bailer was used due to an "out of plumb" well which would not permit a 2' length bailer to descend into the hole. Each bailer was decontaminated prior to using and prior to rinsate sample collection. The decontamination procedure consisted of washing with a trisodium phosphate solution, rinsing with distilled water, rinsing with methanol and finally rinsing with distilled water again. The well number, sample number, date, time, pH, conductivity and temperature were recorded on the sample collection log for each sample.



The ground water samples, water source samples, and three QC samples were sent for analysis to the IT Analytical Services Laboratory in Export, Pennsylvania. Three additional QA samples were sent to the Corps of Engineers Missouri River Division Laboratory in Omaha, Nebraska.

All samples were packed in ice and shipped on the day of collection via overnight courier. Completed Chain-of-Custody and Request forms accompanied the samples. The samples were analyzed for volatile organics, total petroleum hydrocarbons, and total metals. A summary of the analytical results is presented as Table 4 including results of QC analyses. The complete analytical data package is presented in Appendix G. Results of QA analyses from the COE laboratory are reported in Appendix H.

## 4.0 ANALYTICAL RESULTS

### 4.1 INTRODUCTION

This section presents the results of the sample analyses and discusses the significance of the results. The complete analytical data package is presented as Appendix G.

### 4.2 GROUND WATER

The results of the inorganic analyses for ground water were compared to Maximum Containment Levels (MCL) which are enforceable standards for drinking water. They are enforced as Primary Drinking Water Regulations. Table 4 contains a summary of the occurrence and concentration of metals which were detected and those that exceed MCLs in one or more wells.

The MCL for lead (0.05 mg/l) was exceeded in all on site wells. Concentrations ranged from .84 mg/l to .19 mg/l. The standard for arsenic (0.05 mg/l) was exceeded in all wells. The concentrations were reported as .19 to .072 mg/l. The MCL for chromium is .05 mg/l which is based on hexavalent chromium. Detected concentrations in the well samples were .14 in MW-01, .41/.33/.30 in MW-02 (the three results indicate duplicate analyses for one sample and duplicate samples for this well) and .19 in MW-03. Total chromium ( $\text{Cr}^{+3}$  and  $\text{Cr}^{+6}$ ) was analyzed in these samples and the concentration of  $\text{Cr}^{+6}$  may be lower.

It should be noted that the inorganic analyses were performed on unfiltered samples. MCLs are generally applied to monitoring well samples that have been filtered through a 0.45 micron filter. Iron and manganese are present in these waters at relatively high levels (iron up to 590 mg/l and manganese up to 11 mg/l) and may represent particles of iron and/or manganese hydroxides that precipitate and sorb heavy metals on their surfaces. Acidification of the sample dissolves these particles and releases the metals into solution resulting in elevated

levels of metals. This may also explain the elevated concentrations of other metals such as lead.

Total petroleum hydrocarbons were detected in trace amounts in each of the three ground water samples (Table 4). The duplicate sample from MW-02 contained the highest concentration (2.1 mg/l). Samples from MW-01 (1.1 mg/l), MW-02 (.9 mg/l) and MW-03 (.8 mg/l) were lower.

Volatile organic compounds were nondetectable in two wells. In the third well, the only organic compound which was encountered above the detection limit was ethylbenzene at .0052 mg/l. This is only slightly above the detection limit (.005 mg/l) and so may be considered a trace amount.

The QC samples analyzed by IT include a rinsate from groundwater sampling equipment and a trip blank. Neither the rinsate nor the trip blank contained any contamination (Appendix G). The split sample analyzed by IT is included in Table 4.

Three QA samples were sent to the Corps of Engineers Missouri River Division (MRD) laboratory in Omaha, Nebraska for analysis. These included a split, a rinsate and a trip blank. The trip blank and the rinsate did not contain any contaminants. The split sample analyzed by the MRD laboratory was a split of the sample from MW-03. The data was generally in agreement. There were, however, data disagreements for arsenic, chromium and lead. The MRD laboratory reported very low levels of these metals (arsenic, <.002 mg/l; chromium, <.006 mg/l; and lead, <.006 mg/l) while the IT analyzed samples had fairly high levels exceeding the MCLs for these metals (arsenic, .11 mg/l; chromium, .19 mg/l; and lead, .42 mg/l). The report from the MRD laboratory has been included as Appendix H together with explanatory footnotes.

#### 4.3 SOILS

A summary of the chemical soil analyses is presented in Table 3 and the complete analytical data package is presented in Appendix C. As the table indicates arsenic, chromium, lead and mercury were detected in trace amounts in each of the three soil samples. Each of the three samples also contained trace concentrations of total petroleum hydrocarbons. Amounts less than 100 ppm of total petroleum hydrocarbons are generally considered to pose no health hazard. SB-03 contained 96 ppm while the sample from SB-02 was lower (45 ppm) and the sample from SB-01 was nondetectable at the detection limit.

Volatile organic compounds detected in the samples included methylene chloride and 2-Butanone. The methylene chloride is a common laboratory contaminant and probably does not represent actual contamination. The 2-Butanone was detected at a trace level in SB-01 and may represent laboratory contamination also.

Three QA samples were sent to the Corps of Engineers Missouri River Division (MRD) laboratory for analysis. These included a split from SB-01, a rinsate and a trip blank. The trip blank and the rinsate were not analysed. The split from SB-01 was tested and the data generally agreed. Some exceptions were noted in the metals analyses. The MRD laboratory reported arsenic at 7.7 mg/kg while the IT analyzed sample reported arsenic at 13 mg/kg. Barium was reported at 36 mg/kg by the MRD laboratory and at 58.9 mg/kg by the IT laboratory. Chromium was reported at 10.9 mg/kg by the MRD laboratory and at 23 mg/kg by the IT laboratory, lead was reported at 9.02 mg/kg by the MRD lab and 39 mg/kg by the IT lab; and mercury was reported at <0.075 mg/kg by the MRD lab and at .3 mg/kg by the IT laboratory. Also, petroleum hydrocarbons were reported as ND 17 mg/kg by the IT laboratory and at 71 mg/kg by the MRD labs. These results may reflect variations in homogeneity in soil samples which have been composited and split in the field.

The QC samples analyzed by IT include a rinsate from the soil sampling equipment and a trip blank. Neither of these samples contained any detectable contamination. The split sample analyzed by IT is included in Table 3.

## 5.0 CONCLUSIONS

Based on soil and ground water analytical results, hydraulic conductivity testing in the well screen intervals, and a potential low permeability silty clay found in all three borings from the surface to an 8 to 14 foot depth, it is concluded that soils and ground water in the vicinity of soil borings and monitoring wells installed for this evaluation are potentially contaminated by organic solvents or petroleum fuels. If underground storage tanks were installed in the silty clay overlying a very permeable sand and gravel, leakage may have been somewhat contained. If leakage through the silty clay occurs, surface water infiltration through the upper silty clay and the lower sand zone could attenuate the metals concentration during the migration through the approximate 20 to 30 feet of soil to the ground water below.

Results of soil borings and hydraulic conductivity testing in the screened interval show a relatively deep water table (approximately 33 to 40 feet below ground surface) and permeable soils at the well screen intervals (MW-01 is least permeable at  $2.7 \times 10^{-4}$  cm/second and MW-03 the most permeable at  $5.88 \times 10^{-2}$  cm/second).

Analytical testing showed elevated concentrations of arsenic, lead and mercury. Levels of these metals exceeded U.S. typical metals concentration averages in all three soil boring samples, except arsenic in SB-03. Arsenic, chromium, and lead exceeded MCLs for ground water samples in all three wells. Low total petroleum hydrocarbon concentrations were detected in both soil and water samples (maximum of 96 ppm in SB-03 and 1.1 ppm in MW-01); and trace concentrations of volatile organics were detected in SB-01 (2-butanone at 13 ppb) and MW-01 (ethylbenzene at 5.2 ppm).